REMARKS

Initial remarks:

Applicant initially notes with appreciation the Examiner's indication in the March 17 Office Action that Claims 2, 3 and 13-17 would be allowable if appropriately rewritten. In this regard, new independent Claims 20, 22, 25 and 26 include limitations included in dependent Claims 2, 13, 16 and 17, respectively, rewritten in independent form and are therefore believed to be in condition for allowance and such disposition is respectfully requested. Further, new dependent Claims 21, 23 and 24, which include limitations corresponding to limitations in dependent Claims 3, 14 and 15, are also believed to be in condition for allowance and such disposition is respectfully requested

Objections To The Specification

Applicant respectfully requests that the objections to the specification be withdrawn in view of the amendments thereto.

Claim rejections under 35 U.S.C. § 102 and/or 35 U.S.C. § 103:

In the March 17 Office Action, the Examiner rejected Claims 1, 18 and 19 under 35 U.S.C. § 102(e) contending such claims are anticipated by United States Patent No. 6,220,561 to Garcia, rejected Claims 1, 7-10, 12, and 19 under 35 U.S.C. § 102(e) contending that such claims are anticipated by U.S. Patent No. 6,366,414 to Aksyuk et al. (Aksyuk), and rejected Claims 4-6, 11 and 18 under 35. U.S.C. § 103(a) contending that such Claims are obvious in view of Aksyuk.

Applicant respectfully disagrees that Garcia and Aksyuk disclose Applicant's invention as set forth in independent Claim 1 as amended herein, and respectfully submits that independent Claim 1, and all claims depending directly or indirectly therefrom are in condition for allowance. As summarized more fully below, in independent Claim 1, the lever arm pivots to tilt the platform by mechanically coupling an actuation force thereto that is generated without utilizing any portion of the lever arm or platform to generate the actuation force. In this regard, the lever arm and/or platform of the microelectromechnaical system of Claim 1 are essentially passive devices in the sense that the lever arm and/or platform are not electrically biased to generate the actuation force.

However, as summarized more fully below, the micromirror in Garcia is an active device in the sense that an electrical bias is applied between it and capacitor plates in order to generate electrostatic force that tilts the micromirror. Similarly, the beams in Aksyuk are active devices since an electrical bias voltage is applied to the beams to deflect the beams and thereby tilt the platform.

More specifically, independent Claim 1 is directed to a microelectromechanical system comprising a substrate, a platform and a lever arm. The platform is attached to the substrate in a manner permitting the platform to be elevated in its entirety from the substrate. The lever arm is attached to the substrate and is pivotable in at least a first direction with respect to the substrate. The platform is also attached to the lever arm in a manner providing for inclination of the platform in at least the first direction in response to pivoting of the lever arm in the first direction, and the lever arm is pivotable in response to an actuation force mechanically coupled thereto and generated without utilizing any portion of the lever arm and the platform.

Garcia and Aksyuk do not disclose the microelectromechanical system of independent Claim 1. Of particular significance is that both Garcia and Aksyuk do not teach tilting of the platform with respect to the substrate by mechanically coupling an actuation force to a lever arm, with the actuation force being generated without using any portion of the lever arm and platform.

In this regard, in Garcia the micromirror 601 tilts form it's neutral, non-tilted position toward the left in response to "an attractive electrostatic force generated between [capacitor] plate 602 and the grounded micromirror 601" about a pair of floating pivots formed by pivot rods 604 and pivot cups 608 under the left side of the platform 601. The attractive electrostatic force is generated "when voltage is applied to capacitor plate 602". As the micromirror 601 tilts, suspension springs 610 exert a restoring force that holds pivot rods 604 within their corresponding pivot cups 608, and "[w]hen the voltage on capacitor plate 602 is reduced, the micromirror [601] returns to its neutral position, the return motion driven by the action of the suspension springs 610." Similarly, voltage applied to the right capacitor plate 603 achieves tilting of micromirror 601 toward the right. See Col. 5, line 20 through Col. 6, line 3 of Garcia.

Likewise, in Aksyuk "[a]fter the optical device is disposed above the plane of the substrate surface, the optical device moves relative to the plane of the substrate surface in response to an electrostatic field generated between the beams of the electro-mechanical structure and the substrate. The electrostatic field is generated by applying a bias voltage between the beams and the substrate." (Aksyuk, Col. 4, lines 37-43).

A number of advantages are achieved with the microelectromechanical system of the present invention. One advantage is that the problem of electrostatic instability may be associated with using an electrical bias or signal in the micromirror or beams to generate the actuation force that flexes or deflects the micromirror or beams. Such problem is generally not present in the microelectromechanical system of Claim 1 since no portion of the lever arm and platform are utilized to generate the actuation force that pivots the lever arm. In this regard, the electrically biased micromirror and beams of Garcia and Aksyuk and their respective substrates comprise or resemble parallel-plate capacitor-type electrostatic actuators. This is true as well for direct actuation of platforms supported by such beams or other spring elements. It has been recognized that in parallel-plate electrostatic actuators the problem of electrostatic instability or snap-down results when the voltage applied across the parallel plates exceeds a certain value; the moving plate uncontrollably accelerates until it is stabilized by a mechanical force (i.e., the moving plate "snaps-down" against the other plate). (See e.g., "Multiple Solutions in Electrostatic MEMS", a copy of which is included in the Supplemental IDS submitted herewith). In order to achieve the large displacements necessary for large tilt angles with the micromirror or beams of Garcia and Aksyuk, large voltages will be required, thus introducing the possibility of electrostatic instability.

Based upon the foregoing, pending independent Claim 1, as well as its corresponding dependent claims are allowable over Garcia and Aksyuk. There is therefore no need to separately address the patentability of each dependent claim and/or the Examiner's interpretation in relation to any of the dependent claims or any of the references of record in relation thereto.

Conclusion:

In view of the foregoing, Applicant believes that all pending claims are in condition for allowance and such disposition is respectfully requested. In the event that a telephone conversation would further prosecution, the Examiner is invited to contact the undersigned.

Respectfully submitted,

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